Protocols for Test

E. coli Strains and Growth Media

E.coli Top10 was used for all the experiments and grown in Luria–Bertani (LB) medium or M9 minimal medium using glycerol as the carbon source. Kanamycin (10 μg/mL), ampicillin (50 μg/mL) and chloramphenicol (170 μg/mL) were added as appropriate.

Cultivation of Microcystis aeruginosa

Two strains of *Microcystis aeruginosa* were involved in our experiment： one was FACHB-1343, isolated from Lake Tai in 2010 by Yan Xiao, purchased from the Institute of Hydrobiology, Chinese Academy of Sciences. While the other one is PCC7806, which was isolated, identified and kindly offered to us from the Institute of Hydrobiology, Chinese Academy of Sciences during our visit to Lake Tai Station in Wuxi. All samples were cultured in BG11 medium in conical flasks, and grew at 25 ℃ on a 12:12 h light/dark cycle controlled precisely by an illumination incubator.

Microcystin Assay

Caliberation curve of PP1

0.2 to 1 unit of protein phosphate 1(PP1, New England Biolab) was diluted in 20ul NEB PMP buffer and mixed with 180uL of 15mM pNPP dissolved in NEB PMP buffer. The microwell plate(costar 3603 96 well assay plate, Corning Incorporated) containing the reaction system was incubated at 30 ℃. The result was monitored by measuring the absorbance at 405nm every minute for 12 hours with a thermo plate reader.

MlrA Inhibition assay

0.5 unit protein phosphate 1(PP1, New England Biolab) was diluted in 10ul NEB PMP buffer. 10ul of sample containing Microcystin-LR(MC-LR)of the concentration from 1μg/L to 100μg/L was also diluted in the same buffer. PP1 and sample were mixed and incubated at room temperature for 5min and 180uL of 15mM pNPP dissolved in NEB PMP buffer was added. The microwell plate(costar 3603 96 well assay plate, Corning Incorporated) containing the reaction system was incubated at 30 ℃. The result was monitored by measuring the absorbance at 405nm every minute for 12 hours with a thermo plate reader.

MlrA activity assay

A degradation assay was performed for heterologous strains. E. coli. which carried pET21(+)a-mlrA plasmid, pET21(+)a-pelB-mlrA plasmid and pET21(+)a-TorA-mlrA plasmid were incubated with MC-LR at a final concentration of 100ng/L at 25 ℃. Cells carrying empty vector were used as a negative control. Same bacteria solution were centrifugalized and treated by same volume of lysozyme solution(0.5mg/mL lysozyme, 30mmol/L Tris-Cl, 20%(m/V) sucrose). Same concentration of MC-LR was added to the solution. After 12 hours,

36 hours and 72 hours, all the reaction was terminated by heating to 98 ℃. Samples were cooled, diluted 4 times and analysed by PP1 inhibition assay method.

The concentration test of Microcystis aeruginosa

The FACHB-1343 and PCC7086 samples were lysed by a noise isolating tamber, after being centrifuged for 10 min at 4000 rpm, supernatant was isolated and the absorbance of the supernatant was tested at 670nm thus represented for the concentration of Microcystis aeruginosa.

The killing efficiency of purified hen egg lysozyme

Parallel experiments were done to valid the killing efficiency of hen egg lysozyme. Hen egg lysozyme with the graded concentration of 2 μg/mL, 5 μg/mL, 10 μg/mL, 20 μg/mL, 50 μg/mL, 100 μg/mL, 200 μg/mL, 500 μg/mL, 1000 μg/mL, and 2000 μg/mL were added in Microcystis aeruginosa. And the concentrations of Microcystis aeruginosa were tested.